

**P14-1****INFLUENCES OF THE GEOMAGNETIC ACTIVITY ON THE HUMAN FUNCTIONAL SYSTEMS**IRINA STOILOVA and **THOMAS ZDRAVEV**

Solar Terrestrial Influences Laboratory Bulgarian Academy of Sciences G. Bonchev str. Bl.3 1113 - Sofia, Bulgaria  
E-mail: irina@geophys.bas.bg

Functional and organic structure of living organisms is stipulated by complex of the internal biological systems and physic-chemical environment. The variations in this complex is modulated and determined by solar activity and is provoked by changes in geosphere and geomagnetic field (GMF) characteristics associated with solar activity.

The subject of this paper is to indicate the significance of the relations between Earth's GMF parameters and various aspects of human functional systems.

A scarce literature suggests that changes in normal functioning of central nervous system, vegetative nervous system, cardiovascular system and cognitive performance may be enhanced by high changes of GMF (1). Human physiological, psychophysiological and psychical processes and sensory abilities may become increasingly influences in period of significant changes in GMF (2).

The interest in revealing the correlation between the GMF and human functional system is increasing (3,4). Although the possible physiological and psychophysiological mechanisms through with the GFA interact with different processes in the human organism have not been clearly established yet.

Certainly there are some opinions that the changes in GMF have not any influences on the human physiological parameters (5). We mind that a cause for such contradictions in maintenances and results presented from different authors is an absence of enough quantity of scientific evidences. On the other hand the GMF has too dynamic components and it is not easy to have exact values of the local components of the GMF in point of electrophysiological registrations. In this reason it is difficult to do detailed interpretation of physiological influences of GFM activity without simultaneously made GMF registrations. In the same time subjective and objective data confirm that the regional and global fluctuations of GFM produce changes in the human psychical and physiological status.

Various models of reproducing or removing of some geophysical influences are quite useful in this respect. We have investigated two models to eliminate the Earth gravitation: the working environment on board of space station "Mir" and the environments in press-chamber, without compression in it. Main object of the present paper is results obtained using second model of geophysical fields elimination. In this case the press-chamber was used as Faraday cage. Under these conditions we have registered some physiological parameters: brain electrical activity; (EEG) cardiac performance; blood pressure and sleep structure and organisation. Results obtained were compared with those collected from the same persons under normal conditions.

Visual and digital analyses of EEG registrations were made. Sleep stages were recognised and diagrams of sleep stages were composed. The digital ECG signal with step of discretization 512 Hz was processed for digital QRS detection. The R-R intervals' length was determined and the R-R interval function of time was presented by R-R time series. These series were analysed by means of time domain methods (summary statistics) and by frequency-domain methods (power spectrum estimations). Statistical and mathematical methods for analysis were used to extract as more as possible information.

Our researches confirm that in these conditions of the full elimination of the GMF, the human brain produce all normal electrical rhythms -  $\alpha$ ,  $\beta$ ,  $\theta$ ,  $\Delta$ . Spectral analysis of EEG activity shows that the slow activity increase in the conditions of suppressed GMF. All sleep stages are produced and sufficient average duration of sleep is recorded. Deep sleep (III+IV) stages of sleep) is produced well but the organisation of sleep stages and sleep cyclicity is changed. Often the longest than normal sleep cycles were determined. Lack of significant cardiac rhythm disturbances was established. Such the condition mentioned is not disrhythmogenetic factor. Expressed variations in the dynamics of the cardiac rhythm, described by the R-R time interval function were established in particularity. R-R intervals usually increase at the conditions of elimination of GMF since variation coefficients tend to be smaller. The power spectrum of R-R interval function obtained using different algorithms for spectral analysis show predominatingly changes in the low frequency spectral domain. These variations (in EEG, sleep and ECG parameters) have a functional character but they revealed the presence of changes in the fine physiological regulation under conditions presented.

Our current investigations show that some changes in the human physiological parameters produced from the changes in GMF could be monitored and registered but the full quantitative analyses and interpretations it is too early to be done.

The results obtained confirm the necessity of systematically investigations of the influence of geophysical factors on human physiology. These investigations will contribute to the clarification of physiological and psychophysiological mechanisms through with the GFA interact with different processes in the human organism.

## References

- Brand,W., S.Denis. (1989) Geophysical variables and behavior. LVIII. Autonomic activity, hemolysis and biological psychokinesis. Possible relationship with geomagnetic field activity. *Perceptual and Motor Skills*, 68,1243-1254.
- Maynard,N.(1995) Space weather production. *Rev. Geophysics*, Vol.33, (suppl).
- Persinger, M. (1993) Geophysical variables and behavior. LXXI.Diferential contribution of geomagnetic activity to paranormal experiences concerning death and crisis: An alternative to the ESP hypothesis. *Perceptual and Motor Skills*,76,552-562.
- Ivanova,P. (1994) Influence of the variations of some geophysical factors on human health. *Com.Rend.of BAS*, t.47, 2, 42-47.
- Nikolov N., K. Atanassov, I. Cholakov, D. Petrov. Influence of some geophysical factors on the persons with cardio-vascular illness. *Basic Problems of Solar Terrestrial Influences, STIL-BAS*, 996,pp. V112-V114.